

## REMARKS

Reconsideration is respectfully requested in view of any changes to the claims, the Board's Decision and the remarks herein. Please contact the undersigned to conduct a telephone interview in accordance with MPEP 713.01 to resolve any remaining requirements and/or issues prior to sending another Office Action. Relevant portions of MPEP 713.01 are included on the signature page of this amendment.

Applicants acknowledge the following domestic claim of priority:

This application is a Continuation of 08/303,561 09-09-1994  
is a continuation of 08/060,470 05-11-1993 Abandoned  
is a continuation of 07/875,003 04-24-1992 Abandoned  
is a Division of 07/053,307 05-22-1987 Abandoned

Applicants acknowledge the foreign claim of priority under 35 USC Section 119 to an application filed on 23 January 1987 on their behalf in the European Patent Office as European patent application Serial No. 87100961.9 (European '961 patent). Submitted in the parent application (Application Serial No. 07/053,307 filed 05/22/1987) of the present application were (1) a certified copy of the European '961 patent application upon which the claim to priority is based; and (2) a supplemental Declaration and Power of Attorney for the application duly executed by the Applicants, Drs. Bednorz and Mueller on 4 February 1992 and 28 February 1992, respectively, in which a claim of priority under 35 USC Section 119 to the European '961 patent application is made.

Applicants respectfully request rejoinder of "Withdrawn Claims" 73-76, 82, 83, 377, 378 and any other withdrawn claims.

All claims finally rejected for which the rejection thereof were not reversed by the Board's Decision have been amended to be consistent with what the Board's Decision stated are enabled at the top of page 7 under the heading Summary of Decision and in Subsection II at page 17 thereof. As indicated below the Board's Decision did not reverse the final rejection of a number of claims for which the final rejection thereof should have been reversed since those claims contain limitations consistent with what the Board's Decision states is enabled. These claims are not amended since they are consistent with the Board's Decision.

For the reasons given below independent claims 126, 127, 130, 131, 162, 182, 211, 273, 302, 361, 394, 407 and 500 and the following dependent claims which depend from one of the listed independent claims:

- 217 which depends from independent claim 182;
- 308 which depends from independent claim 308;
- 362, 363, 364, 365 and 366 which depend directly or indirectly from independent claim 361

have not been amended since they are in a form which is consistent with what the Board's Decision has indicated are enabled. Thus all claims in the present application in the form they are presented in this amendment should be allowable for the reasons given herein.

In review of the claims for Appeal the following typographical errors have been identified and corrected:

- The term "transistor" in claims 218, 222, 229, 309, 313 and 320 has been changed to "transition".
- The term " $T_c$  m 26°K" have been changed to greater than or equal to 26°K in claims 466, 476, 517 and 522.
- The term "26°K" has been changed in claims 467, 477, 518 and 523 to 26°K.
- The term "A apparatus" has been changed in claims 42, 420, 423, 425, and 427 to "An apparatus".
- The term "superconducting" has been changed in claims 473, 474, and 475 to "superconductive".

In the claims listed below

- the terms "means for passing an electrical superconducting current," "current means" and "electrical means for passing an electrical superconducting current" have been changed to "a current source" and
- the term "means for cooling" has been changed to "a temperature controller".

The terms "a current source" and "a temperature controller" are found in allowed claims, e.g. 167 to 174. The claims in which these amendments have been made are:

1, 12, 24, 27, 34, 36, 40, 42, 46, 55, 57, 58, 59, 64, 69, 77, 84, 86, 71, 91, 93, 96, 103, 109, 123, 130, 135, 137, 139, 140, 361, 373, 374, 379, 383, 386, 438, 496, 497, 535, 543.

To avoid confusion with "means plus function" language claim terms such as "current source for passing a current" and "temperature controller for maintaining a material at a temperature" (and related claim terminology) have been changed to terminology of the type "current source capable of passing a current" and "temperature controller capable of maintaining a material at a temperature." Current sources and temperature controllers were well known as of Applicants earliest priority date and many years earlier and are well known today.

Claim 510 has been amended to add after the last word of the claim, "and" the element "(c) a source capable of providing an electric current to flow in the superconductor element." This is the last element of claim 511.

Claim terms that may be interpretable as method elements, such as "flowing", "cooling" etc, in a structure, device, apparatus, combination type claim have been changed to terminology such as "capable of flowing", "capable of cooling", etc. to avoid any possible indefinites of the claims because of having mixed structure, device, apparatus, combination type claim elements and method elements.

A colon has been added to the end of the preamble transition word "comprising", "comprised", etc. where it was missing.

The Board in its decision did not reverse the Examiner's rejection of:

- the following independent claims:

126, 127, 130, 131, 162, 182, 211, 273, 302, 361, 394, 407 and 500.

and

- the following dependent claims which depend from one of the listed independent claims:

- 217 which depends from independent claim 182;
- 308 which depends from independent claim 308;
- 362, 363, 364, 365 and 366 which depend directly or indirectly from independent claim 361.

These claims will be referred to herein as the "Rejected Claims Which Should Be Allowed." The rejections of these claims were not reversed by the Board's Decision, but Applicants believe, consistent with the Board's Decision, the final rejection of these claims should have been reversed.

Each of the listed independent claims of the Rejected Claims Which Should Be Allowed recite limitations that come within the scope of what the Board in its Decision stated was enabled, in particular see the summary of the Boards Decision at the top of page 7 thereof. Applicants respectfully request the Examiner to review these independent and the dependent claims in the list above in view of the Board's Decision, in particular the summary of the Boards Decision at the top of page 7 and Subsection II at page 17 thereof. Applicants submit that the Examiner will recognize that the Board not reversing the Examiner's rejection of these claims for not being enabled is inconsistent with the Board's Decision and with the Board's reversal of the Examiner's rejection of the claims for which the Board's Decision did in fact reverse the Examiner's rejection thereof.

The top of page 7 of the Board's Decision states:

*Summary of Decision*

The record of this appeal establishes that Appellants' Specification provides enabling support for the rejected claims which define the material exhibiting a superconductive state at a temperature greater than or equal to 26°K as comprising: (1) a transition metal oxide in combination with (2) a rare earth element or a rare earth-like element or a group III B element, and/or (3) an alkaline earth element or a group II A element.<sup>4</sup>

Claims 163, 164 and 183 are representative examples of claims rejected in the Final Action of which the Board's Decision reversed the final rejection thereof. The texts of these claims are reproduced here:

CLAIM 163 An apparatus comprising:

a composition comprising copper, oxygen and any element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, where said composition is a mixed copper oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

CLAIM 164 An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a current source passing an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide and an element selected from the group consisting of Group II A element, a rare earth element and a Group III B element.

CLAIM 283 An apparatus comprising a source of a superconducting electrical current in a composition of matter comprising a  $T_c$  greater than or equal to 26°K, said composition comprising at least one each of a rare earth, and copper oxide and a temperature controller for maintaining said composition of matter at a temperature less than said  $T_c$ .

Applicants believe that the Board's Decision inadvertently did not reverse the rejection of the Rejected Claims Which Should Be Allowed through inadvertent error. For the reasons given below the limitations of these claims, i.e. the Rejected Claims Which Should Be Allowed, are consistent with what the Board's Decision states is enabled as summarized at the top of page 7 of the Board's Decision and with those claims finally rejected which the Boards' Decision did in fact reverse the Examiner's rejection thereof.

The Board's Decision (as stated in the Summary of the Board's Decision at the top of page 7 thereof) found enabled by Applicants' Specification a superconductive element comprising;

- a material comprising a  $T_c$  greater than or equal to 26°K carrying a superconducting current wherein the material:

- comprises a transition metal, oxygen and at least one element selected from the group consisting of a first element group, a second element group and combinations thereof;
- the first element group comprises rare earth elements, rare earth-like elements and Group IIIB elements, and
- the second element group comprises alkaline earth elements and Group IIA elements.

Those claims for which the Board's decision did reverse the Examiner's rejection will be referred to as the Claims found Allowable by the Board's Decision. Under a separate heading it is shown below why each of the independent claims of the Rejected Claims Which Should Be Allowed should be found allowable by the Examiner. They should be found allowable for the same reasons for why the Board reversed the rejection of the Claims found Allowable by the Board's Decision. The dependent claims of the Rejected Claims Which Should Be Allowed should be found allowable since the claims from which they depend should be found allowable.

The text of each independent claim of the Rejected Claims Which Should Be Allowed is quoted below with selected elements in bold underlined text with comments thereafter. The comments point out that each of these claims recite claim elements that includes with in its scope a transition metal, oxygen and an element form the first element group and/or the second element group.

#### **Claim 126**

Claim 126 recites:

CLAIM 126 A device comprising a composition of matter having a  $T_c$  greater than or equal to 26°K carrying a superconducting current, said

composition comprising at least one each of a rare earth, and copper oxide.

"Copper" is a transition metal. An "oxide" contains oxygen. A "rare earth" is a member of the First Element Group. Thus claim 126 should be allowed. The superconductive element of this claim comes within the scope of what the Board's Decision found enabled and thereby allowable.

#### **Claim 127**

Claim 127 recites:

CLAIM 127 A device comprising a composition of matter having a  $T_c$  greater than or equal to 26°K carrying a superconducting current, said composition comprising at least one each of a IIIB element, and copper oxide.

"Copper" is a transition metal. An "oxide" contains oxygen. A "IIIB element" is a member of the First Element Group. Thus claim 127 should be allowed. The superconductive element of this claim comes within the scope of what the Board's Decision found enabled and thereby allowable.

#### **Claim 130**

Claim 130 recites:

CLAIM 130 A superconductive apparatus comprising a composition having a transition temperature greater than or equal to 26°K, the composition including a rare earth or Group III B element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a means for maintaining said composition at said temperature to exhibit said superconductivity and means for passing an electrical superconducting current through said composition which exhibiting said superconductivity.



Claim 130 recites a "transition metal" and "oxygen." A rare earth or Group III B element' is a member of the First Element Group. Thus claim 130 should be allowed. The superconductive element of this claim comes within the scope of what the Board's Decision found enabled and thereby allowable.

#### **Claim 131 As Amended**

Claim 131 as amended recites:

CLAIM 131 (Currently amended) The combination of claim 15,

A superconducting combination, comprising a superconductive oxide having a transition temperature greater than or equal to 26°K,

a current source for passing a superconducting electrical current through said composition while said composition is at a temperature greater than or equal to 26°K and less than said transition temperature, and

a temperature controller for cooling said composition to a superconducting state at a temperature greater than or equal to 26°K;

where said superconductive composition includes a multivalent transition metal, oxygen, and at least one additional element;

where said additional element is a rare earth or Group III B element.

Claim 131 recites a "transition metal" and "oxygen." A rare earth or Group III B element' is a member of the First Element Group. Thus claim 131 should be allowed. The superconductive element of this claim comes within the scope of what the Board's Decision found enabled and thereby allowable.

### Claim 162

Claim 162 recites:

CLAIM 162 An apparatus comprising copper oxide having a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a current source passing an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element.

"Copper" is a transition metal. An "oxide" contains oxygen. A "rare earth" and "Group IIIB element" is a member of the First Element Group. A "Group II A element" is a member of the Second Element Group. Thus claim 162 should be allowed. The superconductive element of this claim comes within the scope of what the Board's Decision found enabled and thereby allowable.

### Claim 182

Claim 182 recites:

CLAIM 182 An apparatus comprising a composition having a transition temperature greater than or equal to 26°K, the composition including a rare earth or alkaline earth element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a

temperature controller maintaining said composition at said temperature to exhibit said superconductivity and a current source passing an electrical superconducting current through said composition with said phrase exhibiting said superconductivity.

Claim 182 recites a "transition metal" and "oxygen." A "rare earth element" is a member of the First Element Group. An "alkaline earth element" is a member of the Second Element Group. Thus claim 182 should be allowed. The superconductive element of this claim comes within the scope of what the Board's Decision found enabled and thereby allowable.

#### **Claim 211**

Claim 211 recites:

CLAIM 211 A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the composition having a superconductive transition temperature  $T_c$  of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature  $T_c$  of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

"Copper" is a transition metal. An "oxide" contains oxygen. In regards to the recitation "at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element." A "rare earth" and "Group IIIB element" is a member of the First Element Group. A "Group II A element" is a member of the Second Element Group. Thus claim 211 should be allowed. The superconductive element of this claim comes within the scope of what the Board's Decision found enabled and thereby allowable.

#### **Claim 273**

Claim 273 recites:

CLAIM 273 An apparatus comprising a composition comprising a transition temperature greater than or equal to 26°K, the composition including a rare earth or alkaline earth element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a temperature controller for maintaining said composition at said temperature to exhibit said superconductivity and a source of an electrical superconducting current through said composition with said phase exhibiting said superconductivity.

Claim 273 recites a "transition metal" and "oxygen." A "rare earth element" is a member of the First Element Group. An "alkaline earth element" is a member of the Second Element Group. Thus claim 182 should be allowed. The superconductive element of this claim comes within the scope of what the Board's Decision found enabled and thereby allowable.

#### **Claim 302**

Claim 302 recites:

CLAIM 302 An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

- (a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a substantially layered perovskite crystal structure, the composition comprising a superconductive transition temperature  $T_c$  of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;
- (b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature  $T_c$  of the superconductive composition; and
- (c) a source of an electric current to flow in the superconductor element.

"Copper" is a transition metal. An "oxide" contains oxygen. In regards to the recitation "at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element." A "rare earth" and "Group IIIB element" is a member of the First Element Group. A "Group II A element" is a member of the Second Element Group. Thus claim 302 should be allowed. The superconductive element of this claim comes within the scope of what the Board's Decision found enabled and thereby allowable.

#### Claim 302

Claim 302 recites:

CLAIM 361 A superconducting apparatus comprising a composition having a transition temperature greater than or equal to 26°K, the composition including a rare earth or an element comprising a rare earth characteristic, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits

superconductivity at temperature greater than or equal to 26°K, a means for maintaining said composition at said temperature to exhibit said superconductivity and means for passing an electrical superconducting current through said composition while exhibiting said superconductivity.

Claim 302 recites a "transition metal" and "oxygen." A "rare earth element or an element comprising a rare earth characteristic" is a member of the First Element Group. Thus claim 302 should be allowed. The superconductive element of this claim comes with in the scope of what the Board's Decision found enabled and thereby allowable.

#### **Claim 394**

Claim 394 recites:

CLAIM 394 An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition having a superconductive transition temperature  $T_c$  of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature  $T_c$  of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

"Copper" is a transition metal. An "oxide" contains oxygen. In regards to the recitation "at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element." A "rare earth" and "Group IIIB element" is a member of the First Element Group. A "Group II A element" is a member of the Second Element Group. Thus claim 394 should be allowed. The superconductive element of this claim comes within the scope of what the Board's Decision found enabled and thereby allowable.

#### Claim 500

Claim 500 recites:

CLAIM 500 An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a **copper-oxide** compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition having a superconductive transition temperature  $T_c$  of greater than or equal to 26°K, said superconductive composition includes **at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;**

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature  $T_c$  of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

"Copper" is a transition metal. An "oxide" contains oxygen. In regards to the recitation "at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element." A "rare earth" and "Group IIIB element" is a member of the First Element Group. A "Group II A element" is a member of the Second Element Group. Thus claim 394 should be allowed. The superconductive element of this claim comes within the scope of what the Board's Decision found enabled and thereby allowable.

□

The changes made to the amended claims do not raise new issues and do not require any additional searching. And, these changes place the claims in better condition for allowance since typographical errors are corrected and claims have been amended to use allowed claim terminology. These changes do not alter the meaning of the claims and do not surrender any equivalents.

#### **SUPPORT FOR ADDED CLAIMS**

Dependent claims 544 to 551 added in the Twelfth Supplementary Response were previously submitted as amendments after the final rejection but were not entered. These claims do not raise new issues and do not require any additional searching since these claims recite terminology allowed in claims: 330, 335, 336, 346 and 358.

Independent claims 552 and 553 are added. These claims do not raise new issues and do not require any additional searching since claim 552 is identical to claim 163 of which the Board's Decision dated 09/17/2009 reversed the Examiner's rejection, where "copper" in the second line of claim 163 is changed to "a transition metal." Claim 553 is based on allowed claim 163 and the Board's Summary of Decision at page 7, line 2-7, thereof.



Added dependent claims 554 to 556 recite that the transition metal is copper and that the transition metal oxide is copper oxide.

Added independent claim 561, 606 and 653 to 658 are based on the Board's Summary of its Decision at the top of page 7 of the Board's Decision on Appeal and those claims for which the Board's Decision reversed the Examiner's rejection for lack of enablement. Added independent claims 561, 606 and 653 to 658 should be allowed since it is what the Board's Decision states is enabled.

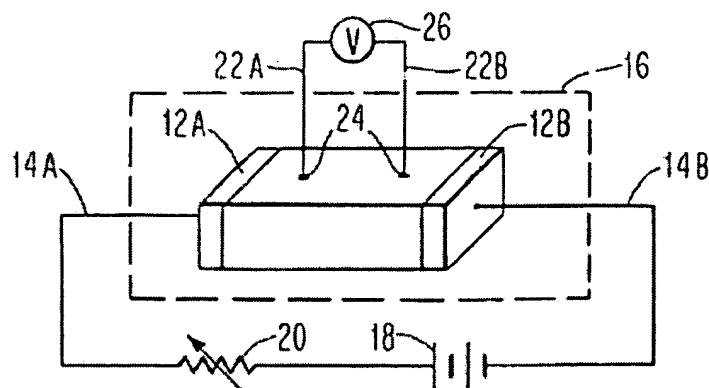
Added claims 562 to 604, 649 and 650 depend directly or indirectly on claim 561 and are based on claims 1 to 560 and Applicants' Specification. Added claims 605 to 648, 651 and 652 depend directly or indirectly on claim 605 and are based on claims 1 to 560 and Applicants' Specification. These claims should be allowed for the same reasons for why claims 561, 606 and 653 to 658 should be allowed.

Added claims 587 to 589 and 631 to 633 are supported by the paragraph bridging pages 2 and 3 of Applicants' Specification.

Added claims 590, 593, 595, 603, 634, 637 and 639 have support in the sentence bridging pages 6 and 7, the paragraph bridging pages 6 and 7 of Applicants' Specification and in Fig. 1.

Fig. 1 is a schematic diagram showing aspects of the present invention wherein the circuit element between electrodes 12A and 12B has an input in contact with element 12A capable of receiving an input current and an output in contact with element 12B capable of outputting an output current through substantially zero resistance in the material between the input and the output as described in Applicants' Specification.

FIG. 1



The Specification has support for added claims 649 to 652. A zero resistance element can have a current flowing in it which does not need a current source or voltage source (or any source) to provide for the flowing current. Once a current is started in a coil with zero resistance the current continues to flow without attenuation without a source of current or a voltage driving it (or any other driving force) since there is substantially zero resistance in the element. Any resistance in such coil will cause the current to attenuate. This is an inherent property of zero resistance. This is supported by the paragraph bridging pages 6 and 7 of Applicants' Specification. Moreover, that this is an inherent property of a superconducting coil is shown by the book "Theory of Superconductivity" M. Von Laue, Academic Press, Inc., 1952 a copy of which is in Brief Attachment AT to Applicants Appeal Brief. This book describes persistent currents at pages 3, 10, 41, 49, 61, 68, 70, 73, 74, 75, 91 and 132. See the index of this book. This book states at in the paragraph bridging pages 2 and 3 of Chapter 1 entitled "Fundamental Facts":

[I]f one merely wished verify the complete disappearance of the resistance below the transition temperature  $T_c$ , experiments with persistent currents, also due to Kamerlingh Onnes<sup>4</sup>, are far more convincing and exact.

(b) One possible procedure is to place a ring or short circuited coil in a magnetic field while its temperature is still above  $T_c$ , cool it down until superconductivity appears, and then remove it from the field. The induced electromotive force produces a current in the superconductor

which will persist indefinitely unchanged in magnitude as long as superconductivity remains.

Support for claim 659 is found in claims 1-560.

## **IN THE SPECIFICATION**

At page 1 of the Specification after the title add:

This application is a Continuation of 08/303,561 09-09-1994, which is a continuation of US Application. Ser. No. 08/060,470 05-11-1993 Abandoned, whichc is a continuation of US Application. Ser. No. 07/875,003 04-24-1992 Abandoned, which is a Division of US 07/053,30 Application. Ser. No. 7 05-22-1987 Abandoned.

This Application claims priority under 35 USC Section 119 to the application filed on 23 January 1987 in the European Patent Office as European patent application Serial No. 87100961.9.

Please charge any fee necessary to enter this paper and any previous paper to deposit account 09-0468.

Respectfully submitted,

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